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Co-operation against Insect Invasions.

IN an editorial article in our issue for September 28 we endeavored to show that the enormous losses every year to our fruits and farm crops, from the depredations of insects, made some concerted action necessary as a protection against these pests. No industry can endure a tax of ten per cent., and this is not an exaggerated estimate of the average loss which our farms and orchards suffer every year from this source. The loss is more than a purely commercial one, for insects and fungi not only destroy marketable products of the farm and the timber of the forest, but by ruining shade-trees and ornamental plants they deface the beauty of the garden and roadside, and in this way detract much from the comfort and pleasure of country life. In a letter referring to our article, Professor J. B. Smith, of the New Jersey Experiment Station, cited striking instances where serious loss could have been averted by timely and united work, and at the meeting of the New Jersey Horticultural Society last week he read a paper on the same subject from which we are glad to select some illustrative cases for instruction and warning.

In 1884 the Pear midge was complained of in an orchard near New Britain, Connecticut, where it had been introduced in Pear stocks imported from France a few years earlier. The insect had been growing with little observation until, in 1883, it took nearly the entire crop of the orchard. The next year, however, Professor Smith found the insect still confined to two adjacent orchards, as there were no other Pear-orchards within several miles. Dr. Riley, of the Department of Agriculture, read papers before fruit-growers' associations, warning all concerned that the insect would not remain fenced in these narrow limits, but would break out and spread over the country, and although he received votes of thanks for his "instructive address," no one attempted to arrest the ravages of the insect. Of course, the orchard of New Britain did not hold it long, and in 1891 it had invaded the Hudson River Valley in injurious numbers, and in 1892 a neglected orchard as far away as New Brunswick, New Jersey, showed that half of the Lawrence and Bartlett Pear trees there were attacked, while a few individuals had invaded a neighboring orchard, one of the best in the state. Of course, the extinction of this insect is now impossible, and no one can tell how many thousands of dollars it will cost the pear-growers of the country to struggle with this pest in future. By co-operative action this particular invasion could have been checked at the outset, and only by co-operative action can immunity from its attacks hereafter be assured. No matter how alert and careful a fruit-grower may be, after the insect once enters a fruit, it is destroyed. He can only take measures after the injury is done to prevent a renewal of it another year. But his individual effort will be of little avail. The valuable orchard above spoken of, lying near the neglected orchard, which is only a breeding-ground for the midge, furnishes a case in point. No matter what measures are adopted by the owner of the good orchard to prevent the development of the insect on his own land, there is nothing to hinder the midges from multiplying by myriads in the neglected orchard, and, when developed, hordes of them will throng over the line to attack the luscious fruit. It is the old story over again, the industrious and energetic man suffers from the lazy indifference of his thriftless neighbor.

The insect most dangerous to the Blackberry is the red-necked cane-borer, which lays its eggs at the axil of a leaf, leaving the larva to girdle the cane. In the effort of the plant to repair the injury the well-known galls are formed, and by simply cutting these out in early spring, when pruning, and burning the cut wood, the entire brood can be destroyed. But the careful grower clears his land to no purpose so long as the beetles will mature on his neighbor's canes, and then fly over to destroy his crop. Near Hammonton, New Jersey, there are many fields which are simply left to take care of themselves and every cane is infested. Such fields are simply nuisances. They will bear no fruit themselves and will produce insects to reduce the crop of all surrounding fields. Last year the crop in that vicinity was reduced twenty-five per cent. by insects alone, and next year the loss will be full one-half of the crop. It is another case where the shiftless husbandman brings ruin upon his neighbor as well as himself.

Now, it would not be difficult to draft a law which might protect a careful fruit-grower from the noxious insects bred by the recklessness of his neighbors. The difficulty at once arises that no such law will be enforced. There are similar laws against noxious weeds, but offenses against them are rarely brought into court. In California a law was passed which required the owners of Orange and Lemon-groves to use remedies which had been proved effective against the scale insect. Few persons obeyed the law, and when actions were instituted under the statute, juries of farmers could not be induced to convict the transgressors. In one of the north-western states, where swarms of Rocky Mountain locusts were devouring every green thing, it was shown that plowing over the ground where the eggs had been laid would destroy the insects and prevent injury the following year. The Legislature passed a law to make this plowing compulsory, and provided for having it done by the state where it was neglected. Still, a very small number of farmers obeyed the law, and some of them even demanded damages for trespass upon their land, when the work was done for them under state authority. It is better to enact no law than to pass one which remains a dead letter on the statute-book and thus helps to breed a contempt for all law. What is needed first in every case is an enlightened public opinion behind any given law, so that its enforcement will be ensured.

In another column of this paper will be found the instructive record of a campaign against the tent caterpillar

in a Massachusetts town. We have no doubt that there are individuals there who give no help to the enterprising societies which are fighting the insect and who make merry over the idea of a bug-bounty. And yet it is just such work as this which tells directly in helping to destroy insect pests in any given instance, and still more in showing how much can be accomplished by united labor for in this way public sentiment can be generated and developed into an efficient force behind future legislation. It is a very difficult thing to unite all the members of a community in any systematic action, even when the necessity is at their very door. It is almost impossible to secure the co-operation of land-owners throughout a state to prevent an evil which they do not see, and which they, therefore, do not dread. But, after all, union for protection is the only practicable way to meet these enemies. This is the first necessity, even if the best of laws are enacted.

The Cedar of Lebanon.

THE Cedar of Lebanon has stood for generations throughout Christendom as the type of all that is majestic and regal in a forest-tree. It has in modern times been questioned whether the timber with which Solomon rebuilt the Temple was that of the true Cedar, but, however this may be, the trees are always associated in the popular mind with stately religious ceremony, and the groves of Lebanon have been objects of veneration by pious pilgrims for centuries. The position which the tree holds in Christian literature is well exemplified by the following passage from the *Spirit of the Hebrew Poetry*, by Isaac Taylor, who, in describing the Lebanon ranges and their trees, says: "In ancient times these rich slopes and valleys were mantled with Cedar-forests, and the Cedar, in its perfection, is as the lion among the beasts and the eagle among the birds. This majestic tree, compared with others of its class, has more of altitude and volume than any of them, it has more of umbrageous amplitude; especially it has that tranquil aspect of venerable continuance through centuries which so greatly recommends natural objects to speculative and imaginative tastes. The Cedar of Lebanon, graceful and serviceable while it lives, has the merit of preparing in its solids a perfume which commends it when dead to the noblest uses. This wood invites the workman's tool for every ingenious device, and its odoriferous substance is such as to make it grateful alike in palaces and in temples." As a matter of fact, it would be difficult to exaggerate the impressiveness of this tree, even if it were not dignified and almost hallowed by association. In vol. ii., page 148, we have already given a figure of one of the old trees on Mount Lebanon, and in the same issue is an illustration of a pair of wide-branching old specimens, such as are to be found in many of the stately pleasure-grounds of England, where this Cedar has been more generally planted for the last two hundred years than any other foreign tree. In connection with the pictures, some account was given of the remnants of the Lebanon forest, as described by Sir Joseph Hooker, and the illustration on page 607 shows one of the nine groups which remain in one of those elevated valleys. Only 400 of the trees survived at the time of Sir Joseph's visit, and unless the seedlings are protected from fire and from sheep and goats, these particular forests will, in course of time, become extinct. The largest trees remaining are some forty feet in girth, and the smallest ones are eighteen inches. Other groups of this Cedar have been discovered since the visit of Sir Joseph Hooker, and, in fact, Cedrus Atlantica, which is found in Algeria and Cyprus, and Cedrus Deodara of the Himalayas differ very little in botanical characters from the true C. Libani, although they are quite distinct in appearance at all stages of their growth. For some unknown reason the Cedar of Lebanon has never been a favorite with American planters, although it is hardy in the latitude of New York, and the few specimens here which have attained the age of fifty years and upward are noble trees.

Notes of a Summer Journey in Europe.—XX.

THE late reconstruction and rearrangement of a large portion of the Arboretum at Kew is likely to give the idea of comparative newness, but there are old trees enough to impress one with a feeling that the establishment has reached a venerable age. For the most part, the specimens, both young and old, are in a vigorous condition; and, it is hardly necessary to add, the correctness of the labeling can be more safely trusted here than in many of the institutions on the Continent. A notice of a few of the specimens and groups may give a faint idea of the collections as a whole. The Oaks may be counted as forming one of the largest generic groups, being represented here by over two hundred species and named varieties. Of the so-called varieties fifty or sixty are forms of the two English or European Oaks, Quercus Robur (also known as Q. sessiliflora) and Q. pedunculata, by far the largest number of these forms being referable to the latter species. Q. pedunculata itself is still classed as a natural variety Q. Robur by many botanists. Of course, most of these fifty or sixty named forms have originated by selection and long cultivation, and can only be propagated by grafting or other modes of division.

There is a good series of the more hardy American Oaks, by far the best specimens being those which come under the black or biennial fruited section of the genus. The American White Oaks, both in England and on the Continent, for some unexplained reason, do not seem to thrive as they do in their native country. One of the finest examples of the American species is a specimen of the Willow Oak (Quercus Phellos), with a trunk over three feet in diameter, and a spread of branches of at least sixty-five feet. This specimen has apparently reached its best development, for a fungus is beginning to show itself in places in the bark. Our Scarlet, Black, Red, Pin (Q. palustris) and Laurel (Q. imbricaria) Oaks all thrive well here, and some of them are said to show fine autumn colors of foliage.

Of other exotic species the Turkey Oak (Q. cerris) and its forms seem admirably suited to the soil and situation at Kew, the branches of the largest specimen seen here spreading about a hundred feet, the trunk being fifteen or sixteen feet in circumference; while Q. conferta, a native of south-eastern Europe, impressed me as being one of the handsomest and most satisfactory of all the species in the collection. A specimen here which gave evidence of very fast growth had a broadly conical outline, large and abundant foliage and a trunk about twenty inches in diameter. The oaks, as well as most of the other trees, appear to be pretty accurately named on the whole, and show the active care and interest taken in them by Mr. Nicholson. The nomenclature of the Lindens, however, is sometimes puzzling, as it is in most collections.

Among other deciduous trees notable for their age or size, examples of Sophora Japonica are likely to attract attention, especially when they are in blossom. One of the largest of these is about fifty feet in height and thirteen or fourteen feet in circumference of trunk. At a few feet from the ground it divides into several very large limbs, which, at about twenty or thirty feet from the ground, are held from breaking or unduly spreading by strong iron chains and encircling iron rings. I was surprised to see this system of supporting weak limbs in practice at Kew, for the iron rings, having been on for many years, were deeply embedded in the bark and wood, and the limbs were evidently slowly and surely being choked to death, and the beginning of the end was shown in large dead branches which workmen were removing. A bolt fitted with a ring or eye at the head, to which to fasten connecting chains or rods, and put through a hole bored in the limb just large enough, is much to be preferred to a ring around it, even though it may be quite loose. The new bark and wood tissue will soon close up the entire space about the bolt, and so prevent the ingress of fungi or other diseases, and the small hole necessary for the reception of the bolt does not materially weaken the limb, certainly not nearly so much so as a band or girdle does after it begins to cause a constriction of the part under it. This ring or band system is very commonly used, and it is often pitiable to see the poor trees endeavoring to overcome the obstruction to the free circulation of its sap by swelling and extending its tissues over the unyielding girdle.

A tree which attracted my attention was an unusually fine specimen of a Hop Hornbeam fifty feet in height, branching near the ground and spreading about seventy feet, and with a trunk over three feet in diameter. It is labeled Ostrya carpinifolia, a native of south-eastern Europe. This specimen is grafted on stock of a Hornbeam (Carpinus) at about two and a half feet above the ground, and it is a good deal larger than its stock, and has a swelling at the point of juncture. No one can

help remarking the striking contrast between the rough bark of the Ostrya and the dark-colored, comparatively smooth bark of the Carpinus. Other such interesting trees are not rare here, but many or most of them are equaled or surpassed as specimens by examples in gardens in various parts of the kingdom.

The collection of hardy conifers is quite large and varied as regards numbers of species, and it possesses a good deal of interest to the specialist in this division of dendrology. But while such species as the Gingko seem to thrive very well, the evergreen conifers must suffer from the great volumes of smoke which sometimes settle over the gardens. This smoke not only proves a great handicap to the production of good conifers, but also operates against other evergreens of the Angiospermous class, and it is a source of great annoyance by sometimes settling and covering the great glass-houses with a thick black dust, which is so persistent and adhesive that it is necessary to wash the glass carefully after some especially severe visitations. If in summer the old leaves of an evergreen plant are rubbed, the persistent black dust will readily come off on the fingers. The proximity of factories and of a great city where soft coal is used is thus a serious drawback to the successful growth of a great variety of evergreens, and as it does not seem likely that this can be ameliorated at Kew such trees as most evergreen conifers will always find this an obstacle in the way of their highest development. This does not mean that such conifers cannot be grown here, for they can be, and are, and the collection at Kew is both large in number of species and interesting in regard to the size which some of the specimens have attained, although, perhaps, few of them are so large as most people would expect to see them.

Possibly it is on account of their being in the midst of this seething multitude, with its gases and coal-smoke, that the Big Trees, or Sequoia gigantea, introduced from the California groves, appear to be degenerating after a good many years of active and promising growth, and after attaining proportions of a fair-sized tree. At first the Sequoia has a fine symmetrical form, but after it attains a height of thirty or forty feet it is liable to become ugly by the loss of branches and a general straggly appearance. Although there may be peculiarly favorable spots in England where the trees may enjoy a life of many centuries and become of large size, their chances for any such development near London seem very slender; and this can hardly be wondered at if we but compare the atmosphere in which the foliage is often placed now with the high pure air which was its element for centuries in its aboriginal surroundings. This is one of our American trees which, although it can be grown in Old England, will not thrive out-of-doors in our cold New England climate. It is gratifying to know that the common name of Wellingtonia, which this noble tree early received in England, seems to be giving way to its proper title—Sequoia. A so-called "weeping" form of this tree is now in cultivation in some foreign nurseries.

The Pines here generally appear quite healthy, and there are some very fair examples of several of our American species. Among these are Pinus Coulteri, over twenty feet high and bearing cones; P. contorta, twenty-five or thirty feet high and also fruiting freely; the dwarf Gray or Jack Pine (P. Banksiana), of our far north and north-west, looking healthy, but as straggly as on its native soil; and an example about nine feet high of the odd so-called One-leafed Pine (P. monophylla) with its leaves both single and in pairs. In another portion of the garden there is a specimen of Pinus Sabiniana with a trunk nearly two feet in diameter and a much larger and handsomer example of the Corsican Pine.

The North American Spruces show much variability between species as to their adaptability to the situation here, and the Himalayan Picea Morinda seems to thrive much better than some of them. This is a species which is not adapted to our New England climate, but it is a desirable tree, having long leaves and long slender branchlets, with the drooping habit of the Norway Spruce. Some of the Hemlocks seem pretty thrifty, but the Junipers are not very satisfactory although some dwarf species seem to do better than others.

Most visitors are interested in the specimen of Chili Pine, or "Monkey Puzzle" (Araucaria imbricata), grown in the open air here, but only known to us when brought under warm shelter in winter. This oldest specimen at Kew was planted in 1796, so that it is very nearly a hundred years old; but it has not attained the size of younger plants in other places. It was one of the first plants introduced, and for many years after its reception at Kew it was grown in a greenhouse as we would a Palm. It was, afterward planted in the open ground, but protected in winter, until it was demonstrated that it was quite hardy in the English climate. It is now only about thirty-five feet high, with a trunk fifteen or sixteen inches in diameter.

The Japanese Gingko is here a thrifty tree, as it appears to be in most places where it has been tried. It is likely to become much more popular, but we do not yet know how it will bear old age in this country.

Arnold Arboretum. *J. G. Jack.*

On Broad Top.—II.

BROAD TOP was beautiful this autumn in an unusual way. The passing of summer was so gradual that at one time it seemed as if winter would find the Maples still green, and a flurry of snow on the 5th of October found them but slightly tinted. They seemed to be eclipsed by the wonderful tones of color shown by the Tupelos, Oaks and Hickories; but the snow turned to rain, and after two days of that, when the curtain of mist rolled away, the Maples suddenly appeared in their old-time splendor.

For the first time in our recollection some of the streams and springs became dry, but, in spite of this, the Ferns and water-loving plants were never more fresh and fine. The Cardinal-flowers seemed unable to end their brilliant life, the Chelones were crowded with blossoms, and the closed Gentians were remarkably numerous and beautiful.

Before the mountain itself showed more than faint touches of color there was a short-lived, but brilliant, display made by a forest-surrounded meadow lying at the lower extremity of this little farm, now our temporary home. The farm, and most of the surrounding mountain, forms part of a 12,000-acre tract belonging to one of the coal and iron companies, and as all the most beautiful country here is in the possession of corporations, no private holdings are possible.

While this farm by no means belongs to the class of "abandoned farms," the fields lying between the house and meadow are object-lessons in the relapse from cultivation to original conditions. Passing down through the fields, we find the uppermost one, which always is in fairly good cultivation, in Clover. The adjoining field has the same starved, slaty soil as the next below, and the two are separated by a fence overgrown with vines and shrubbery. Only a small portion of both is in cultivation, now planted with Corn, Potatoes and Buckwheat; the rest of the thin soil shows a faded growth of Golden-rod. A tree-bordered fence runs along the lower side, and beyond it lies the largest field of all, once like the others, with infinite labor cleared from out of the forest. Now the sparse grass on its sloping surface is covered with a mat of Creeping Blackberry, Asters and Golden-rod, and in the field-corners are thickets of young Maple, Hickory, Yellow Pine, Cucumber and Locust trees.

The meadow which is our destination, though close by, is not visible, as its fence is concealed by a dense growth of Oak, Sassafras and Witch-hazel. Midway in this hedge, a broken panel of fence gives access to the meadow, and from this gateway, framed by two Oaks, the whole scene, an enchanting harmony of color, is before us. The meadow, almost circular in form, is an expanse of silver-green marsh-grass, forming the foreground for brilliant masses of shrubbery, thrown into relief by White Pines on the edge of the forest beyond. In the near foreground lie a couple of crumbling Chestnut-trunks, almost buried in bracken; beyond them is a most effective little island of sedge, and the entire meadow floor is thickly dotted with such quantities of Spiranthes cornua as I have never found elsewhere. The shrubbery crowding every little point of dry land which projects into the marshy grass gives a distinctive character to the place. Almost every species found on the mountain is represented here; most notable for form and coloring are the wild Crab-apple and Thorns. Between the shrubbery and encroaching forest lies a crowded mass of plants, interesting now, but infinitely more so in the spring.

In a cursory examination of a space about ten feet square, I noted closed Gentian, Golden-rod, wild Parsnip, Wintergreen, Arbutus, three varieties of Ferns, several of Grasses, two each of Lycopodium and Cinquefoil, and seven Mosses. Fascinating as is the meadow, it is only one of scores of places equally interesting and beautiful. Of two paths from the meadow, one leading through the woods presents a greater variety than the other, following a wagon-way which crosses between two township roads. We enter the path where it runs close beside a little brook, here curving around some Beeches, the only ones to be found in this part of the mountain. A short distance beyond, four majestic White Oaks, growing equidistant about twenty feet, dwarf everything near them. Through almost the entire length of the path the stream is in sight, sometimes screened by the waving fronds of superb Osmundas, at other times hidden by the Ironwoods, whose delicate foliage in certain

atmospheric conditions appears like a green mist. Aspidiums and Maiden-hair Ferns border our path, the sunshine wavers across the Spice-bushes and against the trunks of some fine Maples, which give their name to this "Sugar-camp Path."

Half-hidden by Ferns, and Spikenard with its graceful racemes of crimson-purple berries, we see the old troughs at the base of the trees. One moment we are apparently in the depth of a forest, the next we have passed between Alders into a sunny lane, between the upper Clover-field and the "Spring-house Meadow." This meadow is a complete contrast to the one we have just left, for here the grass shows only a few pale Violets and Spiranthes instead of the crowded life below; but long after the lower field has faded into monotonous gray this little sheltered spot remains green, and is a most beautiful setting for the home-acre.

Harrisburg, Pa. *Mira Lloyd Dock.*

A Campaign against the Tent Caterpillars.

DURING the last few years the road-sides in the vicinity of Boston, as also in other portions of the state, have been infested in the month of May by hordes of Tent Caterpillars. In some districts rural beauty has been seriously impaired by them, and the ravages of these insects have become an insupportable nuisance. Making their appearance at the season when the leaves of the Apple and Cherry are just unfolding and when the fresh spring foliage is everywhere at its best, the destruction caused by them is painful and depressing to behold. Entire trees and shrubs are completely stripped of their leaves, while myriads of their unsightly nests are left to dangle from the bare branches. To the lover of natural beauty words can hardly depict the appearance which an infected region offers; nor is the sight less revolting which is presented by the remains of the worms crushed under the foot of man and beast, as they crawl in thousands even to the upper rooms of dwelling-houses in search of proper shelter for weaving their cocoons.

In the course of the past year the Newton Horticultural Society had its attention called to this subject by several members, and steps were taken to arrest, or, at least, to mitigate, the evil. A circular was issued giving an excellent plate, illustrating the various stages of the development of the insect, and offering various prizes for its destruction as well as the following information: "The moth lays its eggs on the small twigs of various trees and shrubs, mostly of the Apple and Wild Cherry, in the form of a belt, which encircles the twig. This belt of eggs is covered by the moth with a brown mucilaginous substance, which serves to fasten it firmly in its position, while it protects it from the weather and from other injuries. The belt should be removed from the tree by cutting or breaking the twig upon which it rests, and preserved in a cool place. It will be necessary to present these for examination in competition for the prizes to one or more of the committee whose names are signed to the circular."

In this good work the Horticultural Society had the co-operation of the Newton Centre Improvement Association. As a result, $75.00 were distributed in prizes and gratuities among the competitors, the first prize of $15.00 being given to a young lad who presented over 14,000 belts. The gratuities bestowed were for the purpose of inciting future interest in this direction, and were from the private purse of a generous citizen.

In order that the work may be carried forward systematically next year, a circular has been prepared and sent to the citizens of Newton, in which it is stated that probably 25,000,000 eggs of the tent caterpillar were destroyed last year, and that, in order to stimulate the efforts of the boys and girls of Newton, it is proposed to offer $1.00 for every lot of 1,000 belts. As this will require funds, contributions are invited. The circular also invites the attention of landholders to the fact that worthless trees and shrubs growing on their premises, especially Apples and Wild Cherries, should be cut down, as they are favorite breeding-places for numerous pests. In addition to this circular an advertisement was placed in the local papers, announcing that the Newton Horticultural Society would pay a bounty for every lot of 1,000 belts of eggs of tent caterpillars received before the first of April. It may be added that it is eminently wise to prepare for the work at an early date, so that collections can be made during the winter and spring months.

It is to be hoped that the praiseworthy example of the Newton Horticultural Society may be followed by the adoption of similar or better plans, if possible, by all towns and villages for the extermination of this pest. It would seem, from experience, that the most feasible method of destruction is by collecting and burning the belts of eggs before the period of hatching, which varies with the season, being in this latitude from the middle to the last of April. After the nests are formed, the work becomes one of much greater magnitude and much less satisfactory.

Chestnut Hill, Mass. *Daniel Denison Slade.*

New or Little-known Plants.

Galax aphylla.

THIS is a handsome and interesting plant. It is interesting as the representative of a monotypic genus of a small although very widely scattered family (Diapensiaceæ), which is represented in the flora of eastern North America by the beautiful Pixie-flower, Pixydanthera, of the sandy Pine-barrens of southern New Jersey and North Carolina, by another monotypic genus, by Shortia, of which a figure and description will be found in these columns (vol. i., p. 509), whose only relative is in Japan, and by Diapensia, with a single northern species which extends to Greenland and then eastward to Japan.

Galax (see page 605) is a glabrous herb with red creeping and matted root-stalks, which send up round-cordate thickly crenate-dentate veiny thin leaves, which are persistent through the winter, an inch and a half to two inches across and long-stalked. The single flower-scape is slender, sometimes two feet tall, almost destitute of bracts, and terminated by a virgate spicate raceme of many small white flowers. These are composed of a five-parted minutely two-bracteolate calyx, a corolla composed of five entire oblong petals, which are distinct except where their bases are adnate with the base of the monadelphous stamen-tube, which is ten-lobed above, the lobes alternate with the petals, being short and bearing sessile introrse anthers, while those opposite the petals, which are really staminodia, are larger, linear-spathulate and petal-like. The style is very short, and is crowned by a slightly three-lobed stigma. The fruit is an ovate capsule filled with angular seeds.

Galax is a common plant in the region of the southern Alleghany Mountains, from Virginia to Georgia. At elevations of three or four thousand feet it often covers the ground under Hemlock-trees and other evergreens with great carpets of its beautiful shining leaves, and when the plants are in flower the appearance of this undergrowth is specially beautiful and attractive.

Galax has a bad name with cultivators, and it is rarely seen in good condition beyond the borders of its native home. It was introduced, however, into English gardens as early as 1756; and that it can be cultivated if proper attention is paid to its wants is proved by the great mass of plants in perfect health and beauty which for at least fifty years have been growing and extending in the Knap Hill Nursery in England, where four generations of Waterers have been cultivating and improving American plants.

Of late years great quantities of handsome circular lustrous leaves of a dark vinous color have appeared every winter in the shops of florists in this and other northern cities, and numerous inquiries are addressed to us every year as to the name of the plant which produces these leaves and the source of the supply. They are leaves of Galax gathered among the mountains of Virginia and Carolina and sent north for winter decoration, for which purpose their size, shape and color well fit them.

Foreign Correspondence.

Centrosemas.

I HAVE received inquiries from several American correspondents, and also from friends in England, with respect to the merits of the Centrosemas, and particularly of C. grandiflora, as garden-plants. We have two species in cultivation at Kew—namely, C. Plumieri, an old introduction, generally known, I believe, as a Clitorea, and C.

Virginianum, which was introduced from the West Indies last year as "a new and beautiful species of Clitoria."

Of the other twenty-four species of Centrosema known to botanists, none, so far as I can ascertain, have ever been cultivated here as garden-plants. Judged by dried specimens in the herbarium, by pictures and the descriptions of botanists and collectors, a considerable proportion of these plants are deserving of the attention of gardeners.

The genus is almost entirely American, chiefly Brazilian. It is a near ally of Clitoria, of which genus C. ternata, a stove-climber, with large pea-shaped deep blue flowers, is a well-known garden-plant. All the species are more or less climbers, some of them twining like a Scarlet-runner, others being of less rambling habit. The leaves are generally trifoliate, the leaflets Phaseolus-like, except in one or two species, in which two of the leaflets are entirely sup-

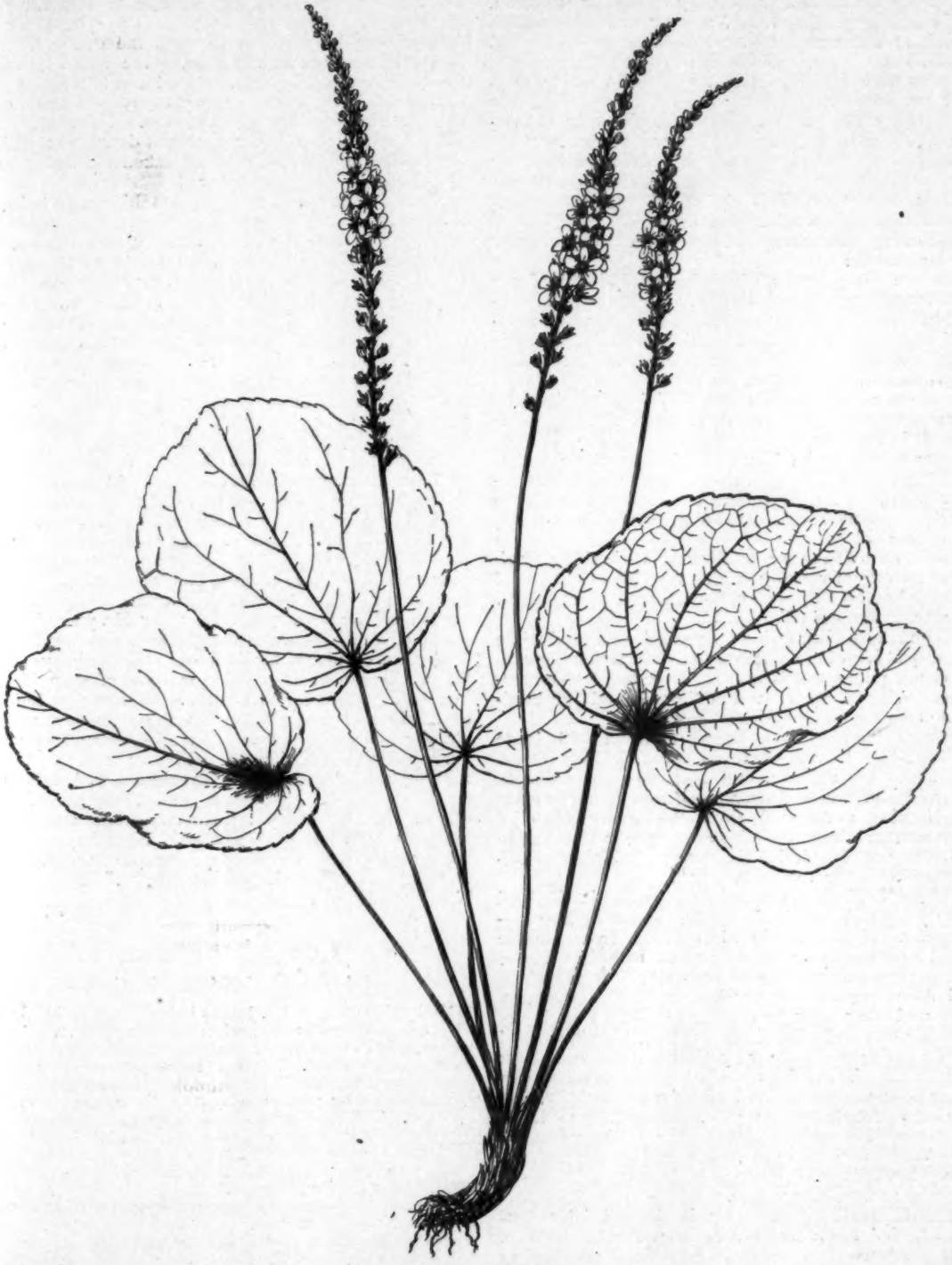

Fig. 103.—Galax aphylla.—See page 604.

pressed. The flowers are papilionaceous, and are remarkable for the large size of the vexillum, or standard, which in some of the species measures fully two inches across. They vary in color from white to rose, violet and blue, and generally they are prettily lined or shaded with other colors. They appear to fruit as freely as the Kidney Bean, the pods generally being long, narrow and four-angled. C. Virginianum has produced a very large crop of good seeds with us this year. The pods of some of the species are eaten as we eat beans. The two species under cultivation here are stove-climbers; at any rate, we find they thrive perfectly in a stove. Possibly, however, C. Virginianum, which is, I perceive, a native of the southern United States, may be successfully grown in an ordinary greenhouse temperature, or even out-of-doors in summer. It may be as hardy as the Sweet Pea, although the species are most abundant in tropical regions.

The following species appear to be worth introducing for trial in the garden:

Centrosema platycarpum. This has exceptionally large broad pods and large purple flowers. Kalbreyer, who collected it in Ocana, describes it as a "papilionaceous twining half shrub, eight to ten feet high, with large single deep purple flowers and large trifoliate leaves." It is also found in Brazil and British Guiana.

Centrosema coriaceum has small Willow-like leaflets, and forms a suffruticose procumbent shrub with large blue flowers. It is Brazilian.

Centrosema vexillatum has ovate leaflets three inches long, and beautiful flowers two inches across. Schomburgk, who collected it in Guiana, called it a herbaceous twiner with large flowers, colored white, with blue streaks, and a purple disk.

Centrosema Brasilianum is another stout climbing shrub with large flowers of varying shades from lilac to blue and violet, some having stripes of yellow through the standard. It is, or was, common in Trinidad.

Centrosema macrocarpum has large edible pods and white flowers, striped with blue. It is a native of Guiana, etc.

Centrosema pubescens is another large handsome-flowered species which Linden found in New Granada, and Kalbreyer in Ocana at an elevation of 4,000 feet.

Centrosema Plumieri is a coarse climber, with large kidney bean-like leaves borne on stout, twining stems. The peduncles are axillary, and each one bears five or more purple and white flowers, one and a half inches across. It was introduced from the West Indies by Dean Herbert, and flowered in his hot-house in October, in 1837. Lindley figured it in his *Botanical Register* as Clitoria Plumieri. It is common in Brazil.

Centrosema Virginianum was in cultivation in England over sixty years ago, but it does not appear to have become popular. It was introduced to Kew last year, where it flowered most profusely in the tropical Water-lily house, its thin twining stems running along the roof for about two feet, and flowering from every leaf-axil. The peduncles are short, and they bear two or three flowers each, the flowers being one and a half inches across, pale lilac lined with purple. The pods are very narrow, and about six inches in length. Treated as a stove-annual, and grown in pots, with the stems trained about a light trellis, this plant would be decidedly attractive. According to Lindley, who figured it as Clitoria Virginiana, it grows on hedges in Virginia and Carolina, also in Jamaica and San Domingo. It varies in the size of its leaves, and some of the flowers are white, others lilac.

Centrosema grandiflorum. This is described by Bentham in *Martius' Flora Brasiliensis* as a climbing shrub, with thin glabrous stems and trifoliate leaves, the leaflets from two to four inches long by one to two inches wide, smooth above, velutinous below. Peduncles axillary, short, bearing from three to seven flowers, in which the vexillum is one and a half inches in diameter, and silky. The pod is six inches long and glabrous. The plant is wild in Central Brazil and in Caldas in Minas Geraes.

This species, or what is supposed to be this, has been described by one who has it in cultivation as "a perfectly hardy climbing plant, of rare and exquisite beauty, which flowers early in June from seeds sown in April, and bears in the greatest profusion inverted pea-shaped flowers from one and a half to two and a half inches in diameter, varying in color from a rosy violet to a reddish purple, with a broad-feathered white marking through the centre. The large buds and the back of the flowers are pure white. Sometimes six or eight flowers are produced in a single cluster. It is well adapted for every garden, especially as a climber, running six to eight feet in a season. Even in the poorest soil it will bloom freely until cut down by frost." This description might easily be mistaken for that of one of Mr. Eckford's latest Sweet Peas!

New Chinese Lilies.—The genus Lilium promises to be exceptionally well represented in China, the number of species now known from that country being twenty-four.* Monsieur Franchet, of the Paris Herbarium, has recently published in the *Journal de Botanique* a classified list of all the species of Lilium now known in China and Thibet, prepared from the collections made in those countries by Monsieur Delavay and others, including Dr. Henry. Mr. Baker has made a brief abstract of this paper for the *Gardeners' Chronicle*, adding a few words about each of the new species. Of these there are twelve, and some of them are evidently very beautiful. Thus L. formosum has white broadly campanulate flowers six to seven inches long; L. Delavayi has flowers like those of L. candidum in form, and colored wine-red, with brown spots; L. ochraceum has flowers of the Martagon type, colored yellow, unspotted, with oblong segments; L. myriophyllum has very numerous leaves and erect, white, large, cup-like flowers; and so on. It is to be hoped that the French collectors have sent home seeds or bulbs of these plants in addition to the dried specimens. The distinct, beautiful, hardy L. Henryi, which, by the way, is omitted from Mr. Baker's list, was introduced in this way from China to Kew by Dr. Henry. Collectors of plants for herbaria should always obtain as far as they can seeds or living material of some kind of all interesting plants for cultivation. If these new Liliums are as hardy and free-growing as those species which are already established favorites in the garden, they will be a very valuable addition to cultivated plants. We have nothing much better than L. speciosum, L. longiflorum, L. tigrinum and L. giganteum, and these are of Chinese origin. Mr. Baker says: "The collections that have been made lately in western China and Thibet have shown that these regions are exceedingly rich in new types, belonging to many of our favorite garden genera." Here is a useful hint for collectors.

London. *W. Watson.*

Cultural Department.

Irises and their Cultivation.—I.

THE publication of Mr. James Baker's *Manual of the Irideæ*, as announced lately in Garden and Forest, is sure to be welcomed by every owner of a garden, where hardy plants are valued and studied. There is no other important family of plants about which reliable information has been more difficult to obtain by persons who do not have access to botanic gardens. The publication of this book from such an authoritative source is sure to give a new impulse, not only to the collection and cultivation of the Irises, but, it is also to be hoped, of the less known species of Gladiolus, which seem to have mostly disappeared from cultivation. It will be a comfort to have a manual, to which one can turn with confidence in the effort to determine the true species, and discover synonyms, not always a simple matter to one with little botanical knowledge. If plants are to be labeled, it is a matter of the first importance that they shall be labeled correctly, and for this we must depend on the acumen of the scientific botanist. In a horticultural way, of course, we are compelled to make certain compromises with scientific knowledge when the distinctions, botanically, seem closely drawn. Moræas, for instance,

*Twenty-five with Lilium Henryi.

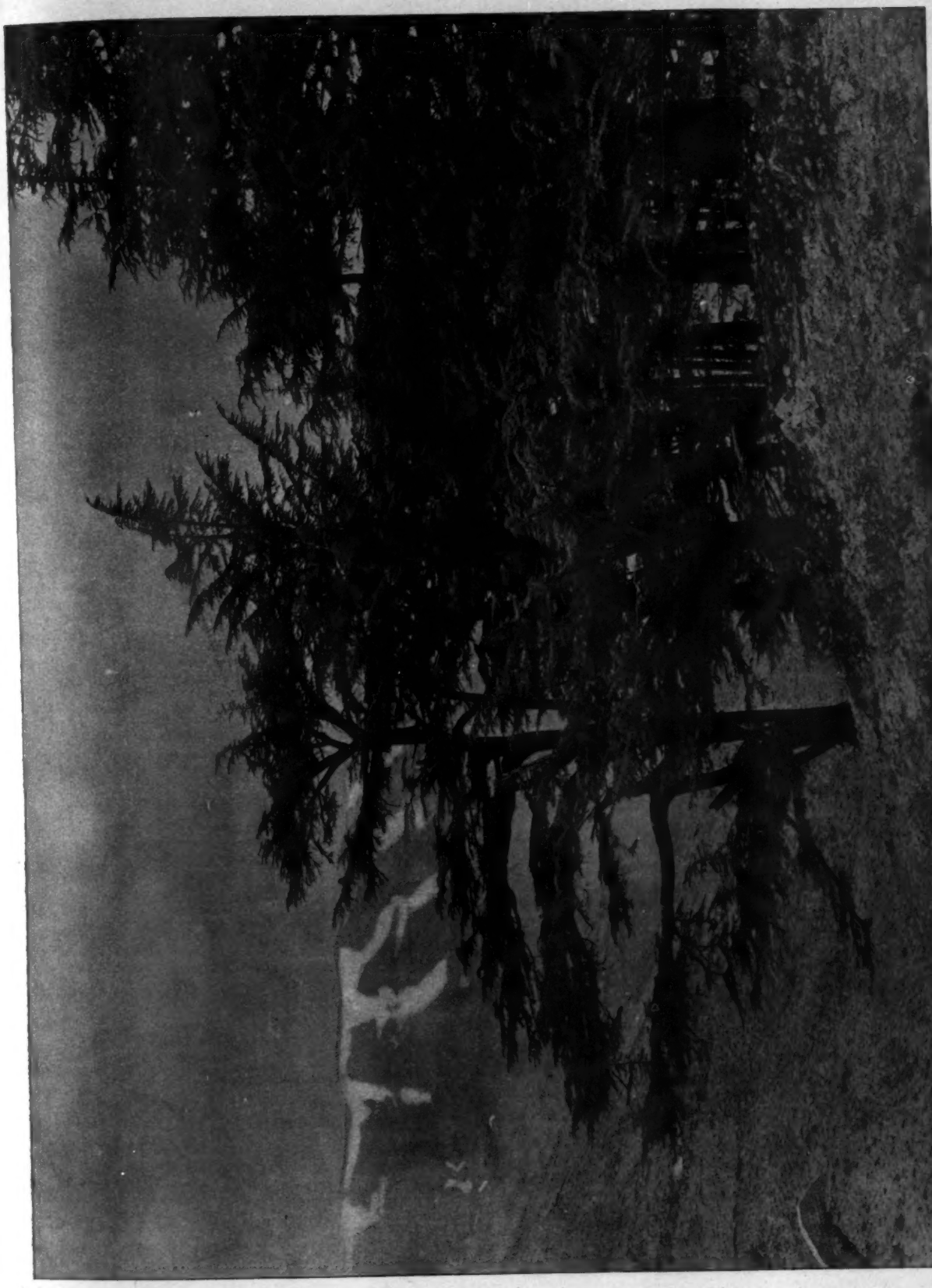

Fig. 104.—Grove of Cedars on Mount Lebanon.—See page 602.

which are still relegated to a separate genus, will probably, in a garden, be always counted as Irises. An ordinary observer would not see any difference, and it would embarrass the average grower to attempt to explain their distinctions. Counting the Moræas, we have, it seems, something over two hundred distinct species of Irises recognized at present, to which, probably, we shall constantly receive accessions. These, with the numerous varieties and hybrids, offer, certainly, a most extended and interesting field to the gardener and student.

As was said editorially a few weeks since, the Irises have ever been the favorite plants of the hardy garden. Though seldom grown in large variety in the average garden, few gardens are without one or more kinds. Next to the double yellow Narcissus, there is probably no plant more widely disseminated in gardens through the country than the common Fleur de Lis. In the older sections of our country, at least, Narcissus telamonius plenus, Iris Germanica and Lilium candidum are a trio, all, or one or more of which, may be found in most old gardens. Besides the Iris mentioned, there are few varieties to be found in country gardens in this section. At least, a flower-loving friend, with a fancy for Irises, has searched this country-side very thoroughly to add to his collection, and has discovered less than a dozen, and these mostly hybrids, or the so-called German Irises. As some other sections of the country may possibly have the same dearth of these plants, it has occurred to me that a few notes on the family may be helpful and suggestive to others, for among the species and varieties are many very interesting plants, second to no others in beauty and garden value, and plants, too, for the greenhouse, the cold-house and the hardy garden.

The species embrace a great range, and it is impossible to give general directions for their culture, for, while some species are very difficult subjects to flower, many kinds are very easily grown, increase very rapidly, and are thoroughly reliable and satisfactory garden-plants. The bulbous kinds mostly are better for an occasional replanting, though among these there are a few which seemingly take a very short rest, and should not be kept out of the ground many weeks. The other sections resent removal, and are somewhat slow to establish thoroughly. They mostly have good, strong, long roots, and appreciate a good deep soil, not too heavy. It is usually a gain to plant these in the early fall to give them a chance for the following season. While some kinds, such as our common I. versicolor, are often found growing as aquatics in a foot or more of water, they do equally well in a dry border. While a fair amount of moisture, not stagnant, is appreciated by most of these Irises, care should be especially taken to plant those whose rhizomes creep at the surface, so that water can freely flow from them. Apparently the only Iris whose flowers are susceptible to increase in size by cultivation is I. lævigata, forms of which, known as I. Kæmpferi, the Japanese have supplied to us. These, while growing vigorously in a dry border, respond to liberal treatment in the way of water and stimulants by giving increased size of flowers. Some of the rhizomatous Irises are said to do well as pot-plants if the roots are crowded, but the few tried by me have as yet failed to flower. I. Tectorum (the Roof Iris of the Japanese), for instance, the leaves of which are very graceful, has failed to flower after two years of closely potted life.

Elizabeth, N. J. *J. N. G.*

Carnations for Market.

THE Carnation in America has become a distinct type. In a literal sense it is a product of the soil. The home-raisers have the field, and the market, too. No foreign importations approach the standard now attained here. A variety to hold its own must be a true Perpetual, of free, low-growing habit, with grassy foliage, allowing the free access of light and air. It must have good stiff flowering stems, with productiveness and good shipping qualities are essential. Owing to the demands of the market, selection during recent years has been in the direction of longer stems. Where a stem produces a number of buds the flowers are small by comparison, unless disbudding is practiced, and growers seldom have the time or inclination to do this. Even with the best varieties, enough short-stemmed buds are produced to meet all the demands of the market for button-hole and bouquet work, and more than this is a dead loss. Another important qualification of a new variety should be a tendency to produce after the first crop an unusually large proportion of single buds. This has always been a good quality of Grace Wilder, and, perhaps, explains why it has remained so long in the front rank among pink Carnations. The same is true of Mrs. Fisher among white varieties, since in this respect it is superior to Lizzie McGowan. A good crimson like Anna Webb or Ferdinand Mangold, with these qualifications, would be a treasure indeed.

Carnation-growers are springing up everywhere, and when it is considered that the outlay for establishing a business in this direction is comparatively light, there is some fear among the older growers that the market will be overstocked. One certain result will be to increase the average quality of the flowers. For first-class blooms there always has been a good market, and the indications are there will continue to be.

To the question, Which is the best white variety for market? growers hereabout unanimously answer Mrs. Fisher. It is a true Perpetual, a heavy and continuous cropper and an excellent shipper. It bears a good-sized, round, full double and sweet-scented flower. During a recent visit to Mr. Nickolson's, of Framingham, I saw part of a lot of 500 plants struck last January, and planted outdoors May 20th, which yielded between the 15th of July and the 20th of September an average of 1,500 flowers per week. These same plants were at the time of my visit (December 5th) blooming in very good form, and there was no apparent difference between them and the remainder of the lot, which were struck later and not allowed to bloom, except that the plants were slightly taller. The argument that certain varieties have a local adaptation seems to hold good in the case of this variety, which is scarcely grown outside the limits of the Boston trade, and has been contemptuously dubbed by the New York and Philadelphia growers the Boston White. Mr. James Tulis, grower for Mr. Homer Rogers, of South Sudbury, has four large houses devoted to it exclusively. The practice adopted here of growing each variety separately has much to commend it. The particular needs of each can be better studied and attended to.

Lizzie McGowan, the popular New York and Philadelphia white, is finding some favor. Its constitution is good, its habit perfect; the stems are stiff, with fine grassy foliage, which admits light and air freely, an essential quality in a winter-bloomer. Its principal defects are lack of substance, and, consequently, poor shipping qualities, and, moreover, it is only slightly fragrant. Silver Spray stands well in comparison with other market varieties; it is a fair shipper and a good keeper. Puritan, a new white, sent out by Woods Brothers last year, is the most promising white among recent introductions. The flowers are very large, of the purest white, beautifully fringed, and have a delicious clove fragrance. It is a fine healthy grower, but, so far as tested, is not a heavy cropper. Tailby's Grace Wilder is the ideal pink variety, and singularly free from any tinge of purple at any stage. It is erect, low-growing, with fine grassy foliage, producing after the first crop an enormous percentage of single buds, rendering it distinctly valuable for long stems. The flowers are finely formed, though not large, beautifully fringed and very fragrant, keeping well when cut. It is, moreover, a true Perpetual, and in this respect is superior to a large number of new varieties of this shade, which, strange to say, more than any other revert to the old border type when raised from seed. Ada Byron, one of Mr. Fisher's new rose-colored varieties, is very promising. It is vigorous in constitution, with good blooming qualities, although rather late. The flowers are perfectly globular, on good stout stems, neatly fringed and fragrant. Nickolson, another of Fisher's, promises well, though not quite satisfactory. It carries a good round flower on stout stems, but is not, so far, a heavy cropper. The color is a lovely red-rose. Daybreak, the new and popular flesh-pink, fully bears out the reputation it has everywhere earned. It is a good healthy grower, though not very prolific. The flowers are very large and finely formed and very attractive.

There is a variety of opinions as to which is the best scarlet. Some grow Portia, a really good bright scarlet, though lacking size; others like Florence, while some prefer Hector. The latter variety is hard to beat where it succeeds. The flowers are of the largest size, of the clearest and brightest scarlet. Florence, a more reliable variety, said to be the seed parent of Hector, is a good clean grower and a splendid cropper. It has the defect, however, of weak stems, and produces an undue proportion of short buds. Mr. James Tulis grows three houses of it, which are carrying an immense crop of bloom. E. G. Hill, a promising new scarlet, is on trial, rather a coarse grower.

As to the best crimson now on the market, honors are divided between Anna Webb and Ferdinand Mangold. Both are strongly clove-scented and very similar in every way; the latter is said to be a seedling from Anna Webb and perhaps possesses a trifle more vigor. As far as I have seen them when growing together I have failed to see any difference; Mr. Tulis, however, has discarded Anna Webb. He had at the time of my visit a magnificent houseful of Ferdinand Mangold. The

air was filled with the perfume of more than three thousand blooms of large size and perfect form. It is not, however, a very profitable variety to grow, owing to the large number of side buds. In a white variety this is not so serious a fault, as many short stems are used in bouquet and other work.

Striped, or flaked, Carnations are not popular, owing to the prevailing fashion of arranging colors separately; for this purpose, distinct and telling self-colors are preferable, but when a mixed cluster is desired a few bizarres contrast beautifully with the others. Mary Fisher is a lovely violet striped on yellow ground. Paxton is one of the best crimson striped on white ground.

Raising seedling Carnations is a fascinating pastime, if not very profitable. As with Chrysanthemums, there is no certainty that the results desired by making a certain cross will be reached. The general opinion is that the tree, or perpetual blooming, varieties have been evolved from the border kinds. But several years ago, when raising border kinds only from seed, I found among them very many true Perpetuals. Raisers here say that seedling Perpetuals often run back to the border kinds, and it is only by very careful selection the ever-blooming standard is maintained. And afterward, in order to perpetuate the variety true to character, it is necessary to select cuttings only from the flowering stems, a fact not duly considered by introducers of new varieties.

Wellesley, Mass. *T. D. H.*

Notes from the Harvard Botanic Gardens.

PLEROMA MACRANTHA.—One occasionally meets with this excellent plant in good condition throughout the country, but it is in general neglected. It is a free-growing shrub, branching abundantly, and may be grown to neat bush specimens or trained on a light-colored wall with equal effect. The opposite, ovate leaves are from three to four inches long, rich green on the upper surface, much paler underneath, and densely pubescent, as are the young branches. The flowers are borne singly on the upper portion of the shoots, and they are from four to five inches in diameter and of a rich blue-purple shade. The color, so rich and uncommon among our greenhouse-flowers, gives these flowers great value; and were it not for their brief duration of but two or three days, this plant would rank among the most useful of those cultivated under glass. The flowers, however, are produced so plentifully and in such quick succession in autumn and winter that their fugaciousness can be partly overlooked. Young plants only a few inches in height bloom quite as profusely in proportion to their size as larger ones, and, therefore, several of them are desirable in decorative collections. A few of them dotted here and there in a group of foliage or other flowering plants add a distinct richness of appearance, and since they can be grown with little trouble, it is astonishing that the plant is not more generally used. It was introduced in 1864 from Brazil, and with us thrives best in an intermediate temperature, with all the air and light possible in summer, without exposure to strong sunshine. The growth is made in the warm season, and at that time the plant needs plenty of water; but the supply must be gradually shortened as the flowers appear, and a very small quantity will suffice in winter. Plants intended for bush specimens may be sparingly pruned into shape at the termination of the flowering season, and repotted in spring. Cuttings of the young wood rooted in early spring will make neat flowering plants the following autumn. Lasiandra is a synonym of Pleroma, and often used in connection with this species.

URCEOLINA PENDULA.—This rare and lovely stove bulbous plant is now in bloom. The bulbs, as we find them in gardens, are roundish, and from two to three inches in diameter. Each bulb develops two, sometimes three, dark green oblong leaves about twelve inches in length. The drooping flowers are borne in large panicles at the apex of an erect scape from twelve to eighteen inches high, the filiform peduncles measuring an inch in length. They are urn-shaped, and the conspicuous portion is about two inches long by half an inch diameter, a rich golden-yellow for two-thirds of its length, the divisions being deep green, margined with white, at the spreading extremity. The leaves disappear when they have completed their work, thus leaving the plant wholly destitute of foliage, when the flowers develop a few weeks later. The bulbs should be turned out of the pots before they commence to grow in spring, and, after carefully removing the exhausted earth from about them, replaced collectively in large pots, or singly in small ones, keeping the summit of each on a level with the surface of the soil. They must now be placed in the stove and kept dry until growth begins, when water may be given freely until the leaves have attained their full size and show signs of changing color. The supply of water should be gradually diminished as the leaves turn from green to yellow, and little or none will be necessary afterward. After flowering, the plants may be placed on a dry shelf in an intermediate temperature, and kept there until the following spring. U. pendula is propagated from seeds and offsets. Some English nurserymen, Messrs. W. Clibran & Son, of Altrincham, have recently been successful in obtaining a hybrid between this plant and Eucharis grandiflora. The new plant is figured in the *Gardeners' Chronicle* of August 20th last under the name of Urceocharis Clibrani, where it was described as interesting and beautiful, with flowers in character curiously intermediate between those of the two parents.

PLUMBAGO ROSEA has been known to cultivators since 1777. It bears dark red flowers, but is not so decorative as its variety Coccinea, obtained by the Messrs. Veitch, from the Nilgiri Hills in 1863. The latter plant, now in full bloom at this place, was very popular for winter decoration some years ago, but it seems to be greatly neglected now. It is a compact, evergreen shrub, from three to four feet high, the branches clad with alternate, oblong-ovate, bright green leaves, measuring from six to eight inches in length. The flowers are almost sessile, and borne in graceful terminal panicles from twelve to twenty-four inches long. The slender tube of the flower, emerging from a short calyx, is nearly an inch and a half long, and the spreading limb of five or six obovate parts, rather more than an inch across. The color is much brighter than that of the species, and the flowers themselves are produced in far greater profusion. The plant is constantly in bloom during the winter months, and it requires a stove or intermediate temperature. It is easily propagated by cuttings. Old plants should be invariably potted in spring, and a week or so before they should be pruned to within two or three joints of the old wood. They like a humid atmosphere when growing freely, but a trifle less heat and moisture will be beneficial later. A position close to the glass will always help secure their best development, and a little shading is necessary in summer, although the flowers take on a deeper and stronger color under full light and sunshine in winter.

Cambridge, Mass. *M. Barker.*

The Forest.

The White Pine for Timber.

FEW questions in practical forestry have greater interest than those which relate to the best methods of growing the White Pine. Mr. Edmund Hersey has lately prepared an instructive paper on the general subject, which has been issued as a bulletin by the Bussey Institute. We publish this paper below, together with some notes which Mr. B. E. Fernow, Chief of the Division of Forestry at Washington, has prepared at our suggestion. We should be glad if other correspondents would give their views, since a full discussion of every phase of the subject is desirable.

As a timber-tree the White Pine possesses more good qualities than any other tree that is a native of Massachusetts. It is easy to grow it from the seed or transplant it when young; it will grow on a light sandy soil or on a peat-meadow; (1) on an ordinary soil the growth is quite rapid, making in thirty-five years from the seed a tree large enough to be sawed with profit into box-boards or coarse lumber; it makes lumber that can be used to advantage for a great variety of purposes.

When a Pine-forest is to be grown from the seed, an effort should be made to secure seed that is new and taken from the cone but a few days before the time it is wanted for planting. (2)

The cones containing the seeds begin to grow in June, and when of the size of the end of one's finger they stop growing until the following year, when, during the summer, they grow to full size, and perfect their seeds early in September; the first frost severe enough to kill Squash-vines opens the cones and the seeds drop out; (3) they are about the size of a Parsnip-seed, are very light in weight, and, having a little wing on them, they float along through the air in a slightly downward direction, reaching the ground sometimes twenty rods from the parent tree, but more frequently not more than from one to five rods. Soon after reaching the earth the little wing separates from the seed, and if the seed is to germinate it becomes partially or wholly covered with earth by a heavy rain, or by the pressure of the foot of a passing animal, or the falling

leaves may furnish sufficient protection to preserve its vitality. When nature is permitted to carry out her own plan of propagating the White Pine her work is more irregular than when assisted by man. Should the seeds leave the cones when there is but little force to the wind, they will drop very near each other at no great distance from the parent tree, and the result will be that a hundred small trees will grow on a space not large enough for more than one large one; but if the seeds leave the cones when the wind is high they will be carried great distances and spread over a wide territory. When man, without too much labor, can assist nature in the more even distribution of the seed it is desirable he should do so, but when he cannot, he may be able to prevent crowding by removing some of the small trees where they cover the ground too thickly, and setting them out in another place where they cannot interfere with each other.

When the seed is to be planted by man, the cones should be gathered just before the first frost in the autumn and placed small end up in the grass away from all enemies. After the first heavy frost, gather up the cones and shell out the seed by turning them small end downward over a vessel and giving them a rap with a stick, when the seeds will drop out. As soon as the seed is shelled it should be planted; it is a mistake to dry Pine-seed several months before planting.

The method of planting must depend on the condition of the soil; if it is a barren plain, shallow furrows may be plowed from east to west five feet apart, turning the furrows to the south, to afford a partial shade to the young plants. The seed should be planted on the south side of the open furrow, dropping two seeds near each other, then leaving a space of four or five feet, and covering the seeds with earth enough to keep them moist, say not far from one-half an inch in depth. (4) On rocky land, or where the soil is hard, dig out with a sharp spade a small sod where the seeds are to be planted, leaving the sod near the hole on the south side for shade, and planting the seed the same as in furrows. In a favorable season enough seed will germinate to cover the land; but if the season be unfavorable, a portion of the land will have to be reseeded the following year. Where the land is shaded by trees, germination will be more certain; but in such places when the seedling Pines are two years old they should be let out into the sunshine by removing the trees that shade them.

In localities where seedling Pines that grow naturally are numerous, it is not expensive to cover land with Pines by transplanting the young trees; to do this to the best advantage trees should be selected that are not over six inches in height, and in removing them a small ball of earth should be removed with each tree, care being taken not to expose the roots to the light or the air, and it is always best to do the work on cloudy days. The trees should be set five or six feet apart, and as they grow a sufficient number should be cut out to prevent crowding. When large enough for box-boards or coarse lumber, not more than four or five trees should be left on each rod of land.

On an average soil, thirty-five years is sufficient to produce White Pine timber of a profitable size to cut for coarse lumber, and, as a rule, on our New England soil; it is more profitable to cut the trees at this age than it is to let them stand long enough to produce trees large enough for clear lumber. It is a mistake to suppose that trees large enough and good enough for clear lumber can be grown on any soil; it is only on soils best adapted to the growth of the White Pine that it is wise to let the trees stand after they are more than twenty inches in diameter. On ordinary, and even on very barren, soils, the young trees grow quite rapidly, and unless the soil is very unfavorable, they will make a satisfactory growth until the largest trees are ten or twelve inches in diameter; beyond this size, if the land be well covered with trees, a very large portion of them will show signs of decay, and only a few growing in the most favored places will continue to grow rapidly; thus the decay on the lot will be nearly equal to the growth.

While it requires but from twenty-five to thirty-five years to grow the White Pine large enough for box-boards, it requires from sixty to seventy years to grow it large enough for clear lumber. When we consider the fact that there is always a ready sale, at remunerative prices, for coarse lumber, and also the uncertainty of getting first quality of lumber by thirty years of additional growth, it would seem unwise to encourage owners of Pine-timber forests to let the trees stand after they are large enough for coarse lumber, except on land strong enough to keep up a rapid growth until the trees are three feet or more in diameter. (5)

Four White Pine-trees set thirty-one years ago now measure, three feet from the ground, as follows: one sixty inches in circumference, one sixty-five inches and two sixty-six inches; the sixty-five-inch tree grows in a wet soil, the remaining three are in a gravelly loam not rich enough to produce more than 800 pounds of hay to the acre. These trees when transplanted were not over six inches in height, and they have grown with other trees set at the same time so near each other that they now completely shade the land. Two trees set on a poor gravelly knoll twenty-five years ago now measure thirty-three and thirty-nine inches in circumference; these trees were about twelve inches in height when set; they have grown on open land.

There have been many opinions advanced in regard to thinning and trimming White Pine forests, and these divergent views have to some extent been caused by a difference of opinion as to how long the trees should be permitted to grow. If a Pine-forest is to be cut when large enough for coarse lumber, it should be treated differently from one that it is to stand long enough to make clear lumber; but little need be done with the former except to cut out the dead and dying trees, while the latter should be carefully looked after from the time the trees are eight feet high until the limbs on the trunk are all off to the height of twenty or more feet. As early in the growth of the forest as possible, the trees that are to remain for lumber should be selected, and the lower limbs on the trunk cut off as fast as it is considered safe to do so and not injure the vigor of the tree; this work should be done in June. After having chosen the trees that are to make the future forest, all the trees between them should be kept back and destroyed as fast as they appear to crowd the selected trees; but it is well to let the trees between stand quite near to the selected ones until they are twenty feet high if they do not overshadow them. By so doing the trees will grow higher and the trunks will have fewer limbs, thus securing clear lumber; in fact, a good White Pine timber-tree rarely ever grows in an exposed position; it must grow where it is surrounded by other trees, or it will not make a long, straight and clear timber-log; he who is to trim a timber-lot must ever keep this fact in mind, and do his work in such a manner as will best assist nature in her efforts to produce trees of the best type for man's use. It is not wise to attempt to grow more than 160 or 170 timber-trees to the acre, but by the selection of this number when the forest is young, they may be given ample room to develop, and there will be left room between them to grow a limited number of trees large enough for box-boards. *Edmund Hersey.*

The article on White Pine, submitted for my examination, contains many good ideas and correct statements, but is not, in my opinion, correct in all respects. It contains many theories that are novel and which need to be proven, and some theoretically correct ideas which do not admit of practical application. For convenience I have indicated the passages with digits upon which I have commented.

(1) While certainly the White Pine will grow, and even thrive, on a wide range of soils, it would be misleading to name a badly drained soil, like peat-meadows, as a locality for it when speaking of its cultivation, and it should have been stated that the best site for it is a fresh to moist, well-drained sand-soil, although even a drier soil yields good results if only deep or permeable enough.

(2) This method of securing seed is neither necessary, nor in most cases practicable. It has, on the contrary, been well established for most coniferous seed, that a certain time of after-ripening increases the per cent. of germination. Most Pine-seeds are best kept over winter and sown in spring, as nature does. The White Pine is a curious exception, shedding its cones in the fall, and thereby indicating, perhaps, that fall-sowing is preferable for it.

(3) The theory that frost opens the cones is new. It is the drying by evaporation from the scales, and the consequent contraction of the outer-cell elements at their base, which makes the scales open; the same process which makes leaves and cones drop eventually. As the cones open near the beginning of October, he who waits for frost may lose his harvest. He had better cut the cones the first weeks of September, spread them on a dry place, a gently sloping roof, for instance, where the sun will open them, and the seeds can be readily knocked out and swept together, or else the drying may be done in warm rooms. The resin on the cones will prevent many seeds from fall-

ing out readily. One bushel of cones will yield less than half a pound of pure seed. In Germany the cones of Scotch Pine are sometimes spread at once over seed-places, and after sunny days turned with brooms to let the seed drop. Rainy days close the cones again.

(4) I would suggest that a more liberal use of seed would in the end be more economical, for the vicissitudes to which the seed is exposed under the unattended conditions of the forest-growth—different from nursery conditions—will necessarily prevent many from germinating; hence an abundant supply, say at the rate of three to four pounds per acre, promises surer success. I would caution those who propose to sow White Pine under the shade of older trees to make sure that the shade is not too dense and that it is soon enough removed. The absence of reproduction of White Pine in our forests, which has led lumbermen to deny that it can be reproduced at all, is probably largely due to the unfavorable light conditions which the seedlings find in the culled forest, where the shade kills them eventually.

(5) While the argument that it is more profitable to grow box-board pine than clear lumber pine may be correct, the writer owes us the proof or at least the basis for his assertion. I admit that profitableness of forest-culture, especially a comparison of the profitableness of two different methods of forest-management in the United States, is a matter almost impossible to discuss on account of the many uncertain and changeable quantities in the calculation. But it would have been possible to furnish some of the facts that need to be known even to estimate possibilities, namely, the quantity of material produced, and its quality at different ages per acre, and present prices for such amounts and qualities, when, together with an interest calculation on expenditures, the greater or lesser profitableness might be estimated. I have no reliable definite data as to yield from which to calculate the comparative profitableness of white pine under the given conditions. Possibilities, however, may be figured as follows: An acre of White Pine on poor soil may yield at thirty-five years 2,000 feet of box-boards at ten dollars a thousand, and ten cords of fire-wood at fifty cents a cord, or altogether twenty-five dollars. At eighty-five years we might expect from the same acre besides some ten cords of fire-wood taken in thinnings, if well managed, at the very least 8,000 feet B. M. of varying qualities, averaging at least sixteen dollars a thousand, and in addition forty cords of fire-wood at probably more than fifty cents, because containing more split-wood, the wood crop altogether amounting to at least $148.00 per acre. If we had bought the acre at thirty-five years after planting for the twenty-five dollars which its crop represented, this would represent compound interest at more than ten per cent. It is to be expected that prices for white pine will have considerably appreciated in fifty years, and the yield by proper management could certainly be increased by fifty per cent., which would bring it to what is expected of Spruce in Germany on third-class soil. If Mr. Hersey has reliable figures to show otherwise, I should be glad to see them.

Washington, D. C. *B. E. Fernow.*

Correspondence.

The Texas Barberry.

To the Editor of GARDEN AND FOREST:

Sir,—Berberis trifoliata, which your correspondent from Texas describes as such an attractive shrub, is hardy in Germantown. Last winter it had not the least covering, and it was not injured a particle. I have no doubt that if set in a clump of evergreens which would protect it, it would live out still farther north. The China tree has also attained sufficient size here to bear flowers and fruits. Many southern trees only need to be protected for a few years, after which they can take care of themselves. A further example of this is shown in two plants of Halesia diperta, which came from Kentucky. For several years in succession they were partly winter-killed, but for some years past they have not been injured, and now they flower and bear seeds every summer.

Germantown, Pa. *Joseph Meehan.*

Meehan's Halesia.

To the Editor of GARDEN AND FOREST:

Sir,—I have often thought that the word "never" is a dangerous one for horticulturists or botanists to use. In the notes I furnished to Professor Sargent regarding Halesia tetraptera Meehani, which was figured in your issue of November 9th, it was said to be sterile or, at least, that we never found more than two or three seeds on the tree. That was true up to the present year when, as if to contradict me, the tree has borne, in the language of my foreman, a "soap-box full of seeds." Last year we had three seeds which were sown, and one of these grew this spring, and, so far as I am able to judge from the leaves, it is in every respect a normal Halesia tetraptera.

Germantown, Pa. *Thomas Meehan.*

Gardening Beside a Hot Spring.

To the Editor of GARDEN AND FOREST:

Sir,—An interesting use of the water from some hot sulphur springs is being made by the Stanford family in Alameda County, California. One of the landmarks of the region is Mission Peak, at the base of which the Spanish settlers founded the old mission San José. One reason why the padres chose this place was because there was a fine group of hot sulphur springs, a few miles south, within easy reach. In fact, the mission would probably have been located at the latter point if there had been a large stream of cold water there. After the American occupation, a famous hotel was built at the "Warm Springs," and large numbers of guests came there by stage. The old register is full of the names of noted politicians and other celebrities of thirty years ago. Governor (now Senator) Leland Stanford purchased the ranch, and a few years later it became the property of his brother, the late Josiah Stanford, whose family make it their summer home. The great hill pastures have been transformed into vineyards of extreme productiveness and value, the district being "on limestone," and frostless.

But the particular attraction at the old "Warm Springs ranch" is now the use that is made of the surplus water. The temperature as it issues boiling from the cement-walled springs is about eighty-five degrees Fahrenheit. The supply is so great that, a few years ago, the owners began to irrigate the orchard, the garden of vegetables and the pleasure-grounds on the slopes of the hill. Everything flourished marvelously. The sediment was abundantly deposited along the channels, to be turned under by spade or plow, but no evil effects followed the use of the water.

Next, a large cement reservoir, low and broad, was constructed on the lawn, with small jets, and a fountain in the centre, and an attempt to grow Water-lilies was commenced here. The family grew interested, and Mr. Josiah Stanford, Jr., soon extended his experiments, until he now grows twenty-five or more species of the best aquatic plants that he has been able to procure. The water-tanks are not roofed over with glass, or in any way protected during the winter season.

Of the native American aquatics, Mr. Stanford grows Nymphæa odorata, N. flava, Orontium aquaticum, Pondeteria cordata, Sagittaria variabilis, Nuphar sagittafolia, Nelumbium luteum, and a number of other species and sub-species. Of the exotic aquatics, he has Nymphæa Devoniensis, N. cœrulea, N. Lotus, N. dentata, N. scutifolia, the pink Japanese Lotus, the large White Lotus, Nymphæa cyanea, Trapa bicormis, or Water-nut of China, Nelumbium speciosum of India, Papyrus antiquorum, some of the Richardias, the large white Australian Water-lily, and some other species whose names I have not obtained.

He received three plants of the Victoria regia, grown at the Golden Gate Park, San Francisco, but this Lily is very hard to move, even when small, and they soon died. He expects, however, to grow it from seed, and there seems no reason to doubt his success, as a temperature of from eighty to eighty-five degrees, Fahrenheit, can easily be had in the water. I should judge that the sheltered ravine in which the warm springs are situated would never be colder than sixty-five degrees at night, and, all things considered, Mr. Stanford will probably succeed with his giant Water-lilies.

It is to be remembered that the warm springs are less than forty miles from San Francisco, in a district where the deciduous fruits compose the bulk of the orchards. Olive, Orange and Lemon-trees are planted to some extent along the valley's rim, near the hills. The springs seem to raise the temperature, and modify the climate of a small area about the mouth

of the ravine, so that it is difficult to limit the horticultural possibilities here. The water-supply is large; a number of greenhouses could be heated by pipes, and the warm southern exposure, if terraced, would serve for a whole series of winter houses for the forcing of flowers for San Francisco. Any gardener can appreciate the comfort of having a constant flow of eighty-five degrees water, summer and winter, in a California climate. Of course, the temperature lessens in the lower tanks to eighty degrees, seventy-five degrees and seventy degrees, or thereabout, but it is eighty-five degrees many yards from where it breaks forth from the mountain.

Berkeley, Cal. *Charles Howard Shinn.*

Notes.

Grape vines can be pruned any time after their leaves fall until late in February, but for many reasons it is best not to delay the work until very cold weather. When it is done on a comparatively warm day, it is not only more comfortable for the pruner but better for the vine.

The *Canadian Lumberman* says that in a warped board the convex side of the curve is always toward the heart of the tree. The warping is due to unequal shrinkage, and it is easily understood therefore why the middle plank is less subject to this trouble than cuts from the other parts of the log.

The thirty-eighth annual meeting of the Western New York Horticultural Society will be held at Rochester on the 25th and 26th of January. No one interested in horticulture, and especially in fruit-growing, can listen to the reports, papers and discussions at these meetings without pleasure and profit.

A dendrological society has recently been organized in Germany under the presidency of Baron St. Paul. Its object is to promote the scientific study of trees. Meetings are to be held regularly, and a journal specially devoted to this branch of botanical science, which every year is growing in importance and interest, is to be founded.

The one hundred and eighteenth volume of the *Botanical Magazine*, which closes with the number for December, is dedicated to Mr. Henry Trimen, Director of the Botanic Gardens of Peradeniya, in Ceylon, which "he has maintained in their former and admired condition," and which, under his able management, "have been greatly advanced in beauty, utility and scientific importance."

Professor J. T. Rothrock has given up his active work in the Biological Department of the University of Pennsylvania, and as general secretary of the Pennsylvania Forestry Association will use his best efforts to excite the interest of the people throughout the state in forestry, and to unite its citizens in efforts to preserve such forests as now remain in the state and to encourage propagation of new growths of timber.

When house plants are accidentally frosted, they should be dipped into cold water or, if too large for that, they should be sprinkled with cold water and then set in total darkness. Under such treatment many of them will come out in two or three days as fresh as ever. Of course it is better that they should not be allowed to freeze, and it is a good plan to roll the stand away from the window on cold nights, or to fasten several thicknesses of newspaper between the plants and the window.

A recent issue of *Le Journal des Orchidées* contains the portraits and descriptions of two remarkable plants recently exhibited from the collection of Monsieur G. Warocqué at the fortieth meeting of L'Orchidéenne at Brussels. The first was a marvelous specimen of Cypripedium Harrisianum, the first artificial hybrid Cypripedium which flowered in Europe. It measured more than four feet in diameter and carried ninety-four flowers. Not less remarkable was the specimen of Cattleya Warocqueana with sixty-four flowers in four, five and six flowered clusters.

At the last meeting of the Montreal Horticultural Society Mr. John Perrin, in a paper on the "Culture of Mushrooms in Winter," recommended that light sheets of paper, such as newspaper, should be spread over them as soon as the clumps appear, and that they should be syringed lightly two or three times a day. Under this treatment they grow faster, become larger and weigh more, having perfect form and color as well as improved flavor. If allowed to become to any extent dry and discolored by the air, they at once acquire an unpleasant taste similar to that of meat which has been too long exposed to the air.

A writer in the *New England Magazine*, in speaking of the Sahara, says that however barren it is in summer the soil is so rich that the day following a rainfall wild Grass will be observed growing, especially in the depressions, but the sunshine in a day or two will soon scorch it. The general surface of the Sahara, although parched and fiery in summer, wears a mantle of green on all places uncovered by arid sand after the first autumnal rainfall. It keeps green all winter, and from that verdure the Bedouins derive their only means of life, the food of their numerous herds of cattle, which is the only tribute which that immense waste pays to humanity.

A correspondent of the *American Florist* writes that a grower of Carnations near Nashville, Tennessee, sets his plants in the open ground in baskets about four inches in diameter made from common wire fencing with a two-inch mesh. The baskets are made by cutting the fencing into strips about twelve inches long and four inches wide, bringing the ends together and folding one end in. Small plants are set out in these baskets in the spring, where they remain in the open ground all summer, and in the autumn the basket is lifted with the plant and transferred to the greenhouse bench. The plant thus has the advantage of being bedded out constantly and is always transplanted with a good ball of soil.

Monsieur Edward André, the distinguished landscape-gardener of Paris, has been appointed professor of the architecture of gardens and greenhouses at the École Nationale d'Horticulture at Versailles. The new course will include theoretical and practical instruction in the art of designing and constructing gardens and parks. Excursions will be made under the direction of the professor in order that the students may be able to see the best examples of the different styles of landscape-gardening. This is the first time that a chair specially devoted to furnishing instruction in this art has been created, and Monsieur André has the honor of being the first professor of landscape-gardening. Systematic instruction in this most important of all branches of the gardener's art could not have been entrusted to a more able, learned and experienced practitioner, and other schools and universities will do well to follow the example which has been set for them at Versailles.

The following list of fragrant Chrysanthemums is given in an English paper: Chrysippe, an incurved flower of bright rosy purple edged with white; the standard old Cullingfordi, a reflexed variety and one of the best crimsons; Dr. Sharp, another reflexed kind, amaranth-purple in color; Exquisite, a pure white single-flowered kind with long narrow florets; Faust, bright purple and incurved; Gus Harris, a single flower with bright lilac florets; Annie Manda, a beautiful hairy variety of pure white; Mrs. Langtry, a pale rose; Nymphæa, a single white kind with florets incurving with age, and Progne, having deep purple flowers of medium size with reflexed florets. The last is pronounced the best Chrysanthemum in cultivation for fragrance. It blooms profusely and the odor resembles that of the Violet. The fragrance of some others is agreeable but indescribable, except in Dr. Sharp, which somewhat resembles that of Progne, and Gus Harris, which is Hawthorn-like.

Bulletin 44 of the Cornell University Experiment Station is devoted to the Pear-tree psylla, which suddenly appeared early in 1891 in many widely separated portions of New York and the neighboring states, and destroyed thousands of dollars' worth of fruit and many valuable trees. It was not a new pest here, having been imported, probably, as long ago as 1832 from Europe. No doubt it has been slowly increasing in numbers until, under favorable opportunities, it all at once worked immense damage. This year the insect did little injury in the orchards which it devastated last year, but it is an enemy against whose attacks pear-growers must ever be on the alert. They should examine their orchards just when the leaves are expanding, and if the nymphs are numerous the trees should be sprayed at once with the kerosene emulsion. A second and third spraying will be profitable if the attack is serious, and especially if but little rain falls to wash off the honey-dew. The destruction of the nymphs is practicable during a period of about two weeks in the middle of May, and a thorough spraying then will so discourage them that little attention will be needed later in the season. Most of the damage is done before the middle of June, but spraying after this date will decrease the number of insects from which the hibernating forms are produced, and the orchard may be saved from a severe attack the following year. The pamphlet contains twenty-five pages, and will be found very complete and interesting as well as instructive and useful to every one who has a Pear-tree.